A+

EXERCISES • QUESTIONS • ANSWERS

2

Installation, Configuration, and System Optimization

LAB EXERCISES

You are gaining more experience and confidence as an information services technician. Today you are preparing to upgrade several desktop and laptop computers. Your tasks will include configuring and installing three IDE devices in a desktop computer; installing and configuring USB devices; installing a SCSI card and internal SCSI tape drive in a desktop computer; and upgrading components in a laptop computer.

The following labs are designed to prepare you for upgrading, extending, and optimizing system performance.

LAB EXERCISE 2.01

1 Hour

Upgrading a Desktop Computer

Wanda's Wedding Wonderland has hired you to upgrade one of their office computers in anticipation of installing new graphics software. The computer will need a second IDE drive and a new CD-ROM drive. You have asked how Wanda wants to use the drives and have learned that she wants to leave her operating system and program files on the first drive, and reserve the second drive for the data generated by her programs, especially the graphics application. You verified that the BIOS in Wanda's computer includes support for hard drives larger than 528MB using LBA (logical block addressing) or a similar technology. Most BIOSs in Pentium-based systems do support large hard drives. Only on 486-based systems or the very earliest Pentiums should you expect to encounter lack of support for large hard drives. Considering her planned use of the two hard drives, you have decided to place them on separate IDE/EIDE channels—each as a master. This will effectively load-balance the predicted drive usage by having I/O for the OS and program drive on its own channel, and the I/O for the data on the second channel. (The A+ exam objectives do not indicate that you need to understand the usage patterns before placing IDE/EIDE devices, but you will want to know this when you are on the job.)

She wants the CD-ROM drive to replace a failed drive. She uses the CD-ROM drive mainly to install software from CDs. She knows that the new graphics software, which she will use to design wedding cakes, has a library of images on CD, which she will copy to her new hard drive. Again, considering the planned usage of the

drives, you will install the CD-ROM drive as a slave on the secondary IDE/EIDE channel. Remember that you can have only two devices per channel!

Learning Objectives

In this lab, you upgrade a computer. You will be adding a second IDE hard drive and an IDE CD-ROM drive. By the end of this lab, you'll be able to:

- Plan for the effective use of IDE devices
- Install multiple IDE devices in a desktop computer

Lab Materials and Setup

The materials you need for this lab are:

- One desktop computer system unit with motherboard, power supply, and floppy drive. Ensure that the computer has both a primary and secondary IDE/EIDE connector on the motherboard. This system should be open, with the power supply, memory, and floppy drive in place. Hard drives and CD-ROM drive should be removed before the lab.
- Two IDE/EIDE hard drives—one identified as the existing hard drive with the operating system installed; the second will be the data drive.
- One IDE/EIDE CD-ROM drive.
- Installation guide(s) for the hard drives and CD-ROM drive, if available.
- Two IDE/EIDE cables, each with two 40-pin drive connectors and one 40-pin connector for the IDE/EIDE connector on the motherboard.
- A large, open workspace with an anti-static mat (if possible).
- A Phillips screwdriver or appropriate nut driver.
- One or more containers in which to place and organize screws and other small parts.
- A notepad on which to take notes and make sketches of the computer and components.
- The user manual for the computer.

If this is the same computer that you used in the Chapter 1 labs,* and *if you saved your drawings and notes, you may reuse those drawings and notes in this lab.

Getting Down to Business

You're now getting into the actual hands-on process of removing and installing components. The steps below will guide you through your task.

If you are unsure of the safe procedures to follow, read ahead in the* A+ Certification Study Guide*, beginning with the section titled "Personal Safety Procedures" in Chapter 4 stopping at Exercise 4-2.

Step 1. Prepare for the task at hand. Observe safe electrostatic discharge (ESD) procedures. If necessary remove the case cover by following the manufacturer's instructions in the user manual for the computer or by following your instructor's directions. Be very careful not to disturb cables inside the system unit as you remove the cover. Place any screws or other removed attachment hardware in a container so that they don't disappear. Stop now and draw a rough sketch, identifying the components and their locations. Also make any notes that will aid you when reassembling the computer.

Step 2. Prepare the two IDE/EIDE hard drives for installation. Since each drive will be a master on a separate IDE/EIDE channel, be sure to configure both drives as masters by setting the jumpers per the instructions for each drive (usually on a sticker on the drive). Write down the type and capacity information for the second drive, in the event that you might need it later for the BIOS configuration. Install and secure the two drives in drive bays inside the system unit. Install the IDE/EIDE cables to the primary and secondary IDE/EIDE channels on the motherboard. (Remember that the stripe on one side of the ribbon cable must go to pin 1 on both the motherboard and the drive!) Connect the drive containing the operating system to the cable connected to the primary channel, and connect the second drive to the cable connected to the secondary channel.

lab Warning

Be sure that the screws you use to install the hard drives are the correct ones. Screws commonly used in computers come in at least two sizes. Although the smaller ones will fit into the mounting holes in the drives and seem to be secure, they can come loose and the disk could cause damage. Also, make sure to use the correct length of screw. Some hard drives have internal components very close to the edge. Using a screw that is too long might cause a problem if it contacts an internal component.

Step 3. Prepare and install the CD-ROM drive. Set the jumper on the drive for the appropriate setting for installing the drive as a slave. Physically install the drive in a drive bay. Connect the drive to the remaining connector on the IDE/EIDE cable on the secondary channel.

Step 4. Ensure that all internal and external cables are connected to the computer. Replace the cover of the system unit, securing it with the necessary screws or fasteners.

Step 5. Power up the computer. Start up the CMOS setup program. If the primary master drive was the one previously installed in this computer, it should not need further configuration in Setup. For the second drive, the default "auto" detection is preferable. If this does not work, then enter the new drive's type and capacity in the BIOS settings. Again, this information is usually found on the label on the drive. Exit from Setup, saving your changes, and allow the computer to reboot.

Step 6. Once the operating system loads, confirm that the drives are recognized. If the second hard drive was not previously partitioned and formatted, it will not be recognized in Windows Explorer, but you may use another tool, such as Disk Manager, Disk Administrator, Device Manager, or WINMSD (depending on the operating system) to confirm the presence of the drive. Do not attempt to partition or format the second drive at this time, because it is beyond the scope of this chapter. You will learn more about partitioning and formatting hard drives in Chapters 8 and 9.

LAB EXERCISE 2.02

1 Hour

Installing a SCSI Controller and Device

Plochmann's Flower Wholesale has requested that you install a SCSI tape backup system in a file server. There is no SCSI controller in the server, so you need to install both a SCSI controller and the SCSI tape backup system.

Learning Objectives

While IDE/EIDE is the common interface for drives and tape backup systems in desktop computers and entry level servers, on the job you will, from time to time, encounter the need to install and configure SCSI devices, such as tape backup systems and older scanners. If you work with medium to high-end servers, SCSI is the drive interface of choice because it is faster than IDE/EIDE and supports more devices. After you've completed this lab, you will be able to:

- Identify the proper procedures for installing SCSI controllers and devices
- Identify the proper procedures for configuring SCSI controllers and devices
- Resolve SCSI device address and termination conflicts
- Identify internal versus external SCSI devices
- Identify the type of SCSI used

Lab Materials and Setup

The materials you need for this lab are:

- One desktop computer system unit with motherboard, power supply, hard drive(s) (installed), CD-ROM drive, and floppy drive. Ensure that the computer has an available expansion slot that fits the SCSI controller provided for the lab. This system should be open, with all components in place, with the exception of the SCSI controller. Verify that an unused power connector is available from the power supply, if an internal SCSI device is to be installed.
- Windows 95 or later version of Windows installed on the computer.

- One SCSI controller card with appropriate internal interface cable.
- One internal or external SCSI tape drive.
- An open drive bay (if installing an internal tape drive).
- Installation guides and drivers for the SCSI controller and SCSI device, if available.
- A large, open workspace with an anti-static mat (if possible).
- A Phillips screwdriver or appropriate nut driver.
- One or more containers in which to place and organize screws and other small parts.
- A notepad on which to take notes and make sketches of the computer and components.
- The user manual for the computer.

***Before you begin this lab, read a good reference on SCSI, which may be an Internet source, such as articles at www.pcmech.com or the entire section titled "Certification Objective 2.02" in the* A+ Certification Study Guide.**

Getting Down to Business

The following steps will guide you through the process of installing a SCSI tape backup system. Because the actual details of an installation will differ slightly depending on whether you are installing an internal or an external drive, we have left these details out of the following steps. Use the installation guide(s) for the SCSI controller and SCSI device for those details.

If this is the same computer that you used in the Chapter 1 labs,* and *if you saved your drawings and notes, you may reuse those drawings and notes in this lab.

Step 1. Prepare for the task at hand. Observe safe ESD procedures. If necessary, remove the case cover by following the manufacturer's instructions in the user manual for the computer, or by following your instructor's directions. Be very careful not to disturb cables inside the system unit as you remove the cover. Place any screws or other attachment hardware in a container so that they don't disappear. Stop now and draw a rough sketch, identifying the components and their location, and make any notes that will aid you when you reassemble the computer.

Step 2. Locate the internal and external connectors on the SCSI controller card. If you are installing an internal tape drive, prepare for installation of the SCSI controller card by connecting the interface cable to the internal SCSI device connector on the card. In the space provided below, identify the type of SCSI card you are installing, and give the characteristics of the SCSI-type that enabled you to identify it.

_____

_____

Step 3. Configure the SCSI bus controller by performing the following steps based on the instructions in the manual for the controller: 1) Ensure that it is properly terminated. 2) Set the logical unit number (LUN) for the controller. The LUN identifies the SCSI controller and distinguishes it from other SCSI controllers in the same system. 3) Configure the controller with its device ID, which should be 7 for the controller. Device ID is similar to LUN, only it identifies multiple devices on the same controller. 4) Determine what resources (IRQ, I/O, etc.) must be assigned and perform configuration on the card if necessary. 5) Install the controller into the computer.

Step 4. If you do not actually have a SCSI tape drive, skip to Step 5. If you do have one, first do any necessary configuration, such as termination for the last device in the chain, and the device ID in the chain, per the manual. Install the tape drive into an empty drive bay and connect the SCSI interface cable if it's an internal drive, or simply connect the SCSI interface cable to both the drive and the controller card if it's an external drive. Also connect a power connector from the computer's power supply to the internal drive (an external drive contains it own power supply).

Step 5. Ensure that all internal and external cables are connected to the computer. Close up the system unit, securing it with the necessary screws or fasteners.

Step 6. Power up the computer. Take any necessary steps to install a driver for the SCSI controller and set the SCSI ID.

Step 7. Install a driver for the tape drive, and confirm that the drive is recognized.

Be sure to carefully study Table 2-1 in the* A+ Certification Study Guide *before taking the A+ Core Hardware exam.

LAB EXERCISE 2.03

30 Minutes

Installing and Configuring Peripheral Devices

Technicians at Nerd Matrix work with both external clients and internal clients. The external clients are the main focus of the business but, like all other companies, Nerd Matrix has their own infrastructure to support. You have been called to the operations department to install two new peripheral devices on a desktop computer—a mouse and video camera.

Learning Objectives

Although peripherals come in all shapes, sizes, and technologies, you can apply a standard set of procedures to the installation and configuration of peripherals. After you complete this lab you will be able to:

- Identify the proper procedures for installing peripheral devices
- Identify the proper procedures for configuring peripheral devices
- Identify specific steps to take when installing USB devices
- Identify specific steps to take when configuring USB devices

Lab Materials and Setup

For this lab exercise, you'll need:

- One fully PnP desktop computer with motherboard, power supply, keyboard, hard drive(s), CD-ROM drive, and floppy drive. Ensure that the computer has two USB connectors. This system should be completely assembled, closed, and ready to be powered up.
- Windows 95 with USB support (Windows 95b or 95c) or later version of Windows installed on the computer.
- One USB mouse.

- One additional USB device (optional—the lab steps use a camera).
- The user manual for the USB device(s).
- The user manual for the computer.

lab Warning

Windows NT does not provide USB support.

Getting Down to Business

In this exercise, you'll install a mouse and video camera on a desktop computer. In doing so, you will see that you install these USB devices while the computer is running, because USB is both Plug and Play (detected automatically) and hot swappable, meaning that a USB device can be added or removed while the computer is running.

Step 1. As with all new peripherals (or any hardware for that matter), read all documentation that came with the USB devices. Then remove the device from its packaging. Remove any packing material from within the device and any items taped or otherwise attached to it. Perform any assembly or other steps that are described in the documentation.

Step 2. Power up the computer and log on, if necessary. After the desktop appears, plug the USB mouse into one of the USB ports. The mouse should be automatically recognized, without the need for additional software, unless the mouse driver is not available with your operating system. Record your observations below, as well as any action you were required to take after installing the mouse:

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_____

lab Warning

Make sure the system is running before plugging in a USB device for the first time. If the system is not running when a USB device is plugged in for the first time, it cannot recognize that the device has been connected, and you will spend considerable time trying to figure out why an easy-to-install PnP device doesn't work. Also note that with Windows 2000 or later, the user who is logged on during the initial connection of a USB device must be a member of the local administrators group, because only an administrator can install a driver. After the initial connection and installation of the driver, a non-administrator may reconnect the device without problem.

Step 3. Unplug the USB mouse and describe what appears on your monitor as a result of this action:

_____

_____

Step 4. Plug the USB mouse back into the computer and record your observations below:

_____

_____

Step 5. Plug in your second USB device, taking any necessary steps, and record your observations below:

_____

_____

***For more information on upgrading computers by installing and configuring peripheral devices, read the section titled "Installing and Configuring Peripheral Devices" in the* A+ Certification Study Guide.**

LAB EXERCISE 2.04

1 Hour

Using Disk Utilities to Upgrade System Performance

The shop foreman at LabelPerks, a major producer of custom labels and stickers, has complained to you that some of the computers on the production floor seem slower than other, similarly configured computers. Experience has taught you that system performance can often be improved by regular defragmentation of the data on the hard drives, as well as by testing and resolving problems such as lost clusters, cross-linked clusters, and bad sectors.

Microsoft has included drive defragmentation software in all Windows versions beginning with Windows 95, with the exception of Windows NT. For Windows NT, you will need to use a third party program, such as Diskeeper from Executive Software.

For instructions on defragmenting a hard drive with the Microsoft utility, see Exercise 2-5 of the* A+ Certification Study Guide. *For information about Diskeeper, check out www.diskeeper.com.

Microsoft has provided two programs, CHKDSK and ScanDisk, in order to solve the problems of lost clusters, cross-linked clusters (sometimes referred to as cross-linked files), and bad sectors. Windows NT, and Windows 2000, and Windows XP use CHKDSK, while Windows 95/98 uses ScanDisk.

On a FAT file system volume, lost clusters occur when the FAT table indicates that one or more clusters contain data, but there are no directory entries that point to these clusters. CHKDSK and ScanDisk resolve lost clusters by creating directory entries that point to the clusters. You will see these entries as filenames in the root of the drive, all with the CHK extension.

What causes lost clusters? The most common cause of lost clusters is the abnormal ending of a program or operating system. This can be a "crash" in which the software behaves very poorly and takes the computer down, a rude shutdown by the user (hitting the big red switch rather than using the Shutdown command), software "freezing" or "hanging up," or other similar events. What they all have in common is the abrupt interruption of an application or the operating system. This leaves files open on the hard drive. On a FAT volume, this can mean that the space was allocated through the FAT table, but a directory entry was either not created or not updated.

Cross-linked files are nearly (but not quite) the opposite problem—two or more directory entries point to the same clusters resulting in conjoined files. CHKDSK and ScanDisk will give the disputed space to one of the two files, but this is not usually a complete resolution. It may leave one of the files with missing parts and the other file with extraneous parts. The files that result from the repair of lost clusters and cross-linked files by CHKDSK and ScanDisk are usually, but not always, useless. The "found" lost clusters are often the temporary files created by your applications, not the actual data files. Once you determine that no data is missing, you can delete the files. The best solution is to delete the resulting files (*.CHK) and restore the files from a backup that predates the damage.

Allocation problems, such as lost clusters and cross-linked clusters, are common with the FAT file systems, but rare with NTFS because it has built-in recovery capabilities.

In addition to detecting the logical problems of lost clusters and cross-linked files, all of these utilities are also capable of detecting bad surfaces—identified as bad sectors. In this case, the utility cannot actually fix the damage, but will mark the cluster that contains the bad space as "bad" in the allocation table of the file system so that no new data will be written to this space.

Be sure to verify that no data is missing before deleting the *.CHK files. We have gone for years without finding actual data in lost clusters. However, a consultant we know had a system failure, after which he could not find a very important Microsoft Access database. He ran CHKDSK /F, which converted many lost clusters to files. Then he noticed that one of the *.CHK files was the size of the missing database. He rescued the database by renaming the file. When the renamed file was loaded into Access, it was, indeed, the missing data. He was a hero, and his contract with that Fortune 500 company was renewed!

Learning Objectives

To enhance the performance of hard drive systems, service technicians must know how to work with disk utilities. Once you've completed this lab, you will be able to:

- Use CHKDSK to detect and correct file allocation problems
- Use ScanDisk to detect and correct file allocation problems

Try Exercise 2-5 in the* A+ Certification Study Guide *in which you defragment a hard drive.

Lab Materials and Setup

The materials you'll need for this lab are:

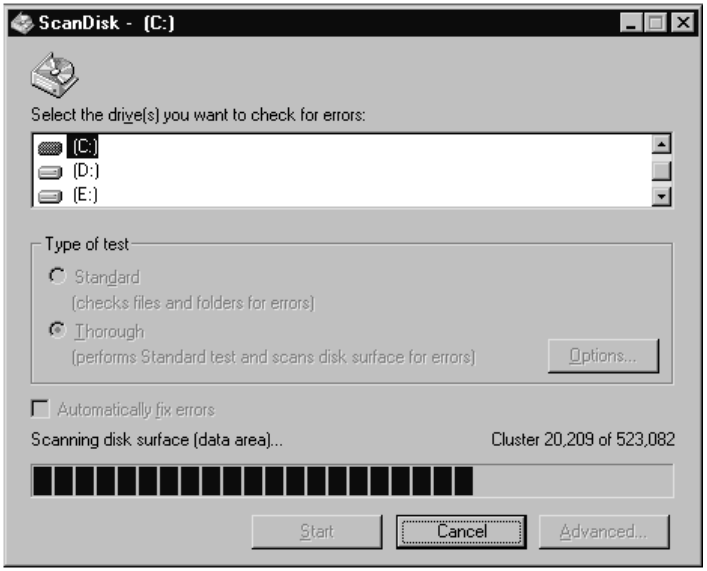
- A computer running Windows 95 or greater.
- If you are running a Windows operating system other than Windows 95 or 98, you will need to be logged on with local administrator privileges to run these utilities.

Getting Down to Business

In this lab you will use the CHKDSK and/or ScanDisk commands to test your hard drive for logical problems such as lost clusters or cross-linked files, and physical problems, such as bad sectors. A bit of advice: Always turn off any screen saver that may be running before using ScanDisk because it can interfere with the test.

Step 1. Open a command prompt and enter the command CHKDSK. The results you receive will vary depending on the operating system you are running:

- **Windows 95/98** will immediately display a message stating that CHKDSK has not checked the drive for errors, and that you must use ScanDisk to detect and fix errors on the drive. It will also display statistics of disk capacity, usage, allocation unit size, and the total bytes of memory (REAL mode memory only!). So if you are running Windows 95/98, you must run ScanDisk. See the ScanDisk GUI program in the following illustration.



- **Windows 2000** will take several minutes to examine the current drive. On a FAT volume, CHKDSK will examine the contents of the FAT table, root directory, and subdirectories, performing an audit to ensure that all clusters indicated as being in use in the FAT table are referenced (either directly or indirectly) from the directories.

On an NTFS volume, CHKDSK has three stages. In stage 1 it verifies files, in stage 2 it verifies the NTFS indexes, and in stage 3 it verifies the security descriptors. Following these three stages, CHKDSK continues with a verification of the USN Journal, which is the Change Journal on a Windows 2000 NTFS volume (further defined in Chapter 8). When this last step is complete, it displays the results of the tests plus disk statistics. See the output from CHKDSK in the following illustration. Notice that, although the tests were run, CHKDSK did not fix any errors because we did not run CHKDSK with the /F option. We did not do this because we wanted to see the results of the analysis. If you run CHKDSK with the /F option on a volume that is in use (as C: was in this example), it will display a message that it cannot lock the current drive and cannot run because the volume is in use by another process. It then asks if you would like to schedule the volume to be checked the next time the system restarts and gives you the good old "(Y/N)" option. If you enter "Y" it will run CHKDSK /F the next time the computer boots. This will occur after you select that installation of Windows 2000 from the boot menu. At that time, if you are watching carefully, you will see a black character mode display in the middle of the screen with a graphical band displaying the Windows 2000 logo above and a smaller, plain blue/gray band below. You will have 5 seconds to choose not to have the CHKDSK program run. If you do nothing, CHKDSK runs.

- **Windows NT** behaves similarly to Windows 2000, displaying less status information while it runs, and without the tests for the enhancements to the NTFS files system. If you use the /F switch, NT also displays a similar message to the one previously described and prompts you to choose to run CHKDSK at the next reboot. At that time, it runs CHKDSK (actually, the AUTOCHK program) during the initialization stage of the operating system startup, displaying CHKDSK progress information in the blue character mode screen. It will reboot the computer at the conclusion of the CHKDSK operation.

If you choose to have CHKDSK run the next time the computer boots, you will need to watch carefully in order to see it run. Once CHKDSK completes, the operating system completes its startup procedure or (in the case of NT) reboots the computer. If you look away at the wrong time you will miss it all.

Step 2. Enter your observations on the previous step, including which operating system you used and the results of running CHKDSK. If you are running Windows 95/98, indicate the results of running ScanDisk in both Standard and Thorough modes:

_____

_____

Step 3. Now run the program through the GUI. From My Computer or Windows Explorer, right click on the drive, select Properties | Tools | Error-Checking, and click Check Now. On Windows 95 and Windows 98 it runs ScanDisk, while Windows NT 4.0, Windows 2000, and Windows XP run CHKDSK.

***Do not be overly concerned with the FAT or NTFS file systems now. The discussion here is only for the purpose of defining ways to optimize system performance. We will examine the particulars of the various file systems in Chapter 8. Are you too curious to wait? Check out the section labeled "Certification Objective 8.04" in the* A+ Certification Study Guide**.

Step 4. There is much more to the CHKDSK story. In this step you will research and learn more about CHKDSK. Use your Web browser to connect to the Microsoft Technet site at www.microsoft.com/technet. In the Search box enter "Q187941"

(without the quotation marks) and click the GO button. Read the article titled "An Explanation of CHKDSK and the New /C and /I Switches." This article contains an excellent explanation of how CHKDSK works. Answer the following questions:

a) Name two utility DLLs used by CHKDSK.

b) When is the optional fourth pass of CHKDSK performed?

c) Give one reason for running CHKDSK in read-only mode, and then give a reason for not running it in read-only mode.

LAB EXERCISE 2.05

1 Hour

Upgrading a Portable Computer

Once again, this is an inside job. The sales manager of Nerd Matrix needs to have his portable computer upgraded. His present hard drive is running low on disk space, and he wants it replaced with a new, larger one. The BIOS also needs to be upgraded because of a problem it has with recognizing USB devices.

Learning Objectives

After you complete this lab you will be able to:

- Identify the proper procedures for replacing a hard drive in a portable computer
- Identify the proper procedures for upgrading the BIOS in a portable computer

Lab Materials and Setup

It is often true that portable computers become obsolete before they need components upgraded. However, there are exceptions, especially when a computer is heavily used, as in the case of the sales manager. Nerd Matrix recommends these portables to many of their clients and has a contract with the supplier for components. The hard drives are considered field replaceable units (FRUs), and the manufacturer includes instructions on upgrading, or "flashing," the BIOS. When the new hard drive came in, other technicians, using special hardware, brought it up to Nerd Matrix specifications by placing the standard Sales Department image on the drive in advance of your installing it.

The materials you need for this lab are:

- One portable computer, completely assembled, closed, but powered off
- Windows 95 or later version of Windows installed on the computer
- A large, open workspace with an anti-static mat (if possible)
- A Phillips screwdriver or appropriate nut driver
- One or more containers in which to place and organize screws and other small parts
- A notepad on which to take notes and make sketches of the computer and components
- A hard drive that fits the computer
- The user manual for the computer

If you do not have a spare hard drive, simply remove and reinstall the same one.

lab Warning

Do not do any step of this lab for which you do not have clear documentation and instructions for the exact model of portable on which you are working. Flashing a BIOS is a very delicate matter that should be done only when absolutely necessary, and only using careful instructions from the manufacturer. A technical trainer we know had two laptop computers that he used in classes. He successfully installed beta 3 of Windows 2000 on both of these machines, but could not install the released version of the product. The manufacturer provided him with a flash upgrade, which he ran on both machines. The flash upgrade had a bug in it and caused both machines to be absolutely unbootable. Had he run the program on just one machine at a time, he would have had at least one machine that would boot (without the released version of Windows 2000). The next week, the manufacturer sent him a patched flash program and he was back in business.

Getting Down to Business

In the following steps you will prepare the portable computer by removing the current hard drive, then you will install a replacement hard drive and test it to be sure it is recognized and boots up. Finally, you will determine what steps would be necessary to upgrade the BIOS. You will perform a BIOS upgrade only if appropriate.

lab Hint

Flash BIOS is common in both desktop and laptop computers. A few years back, flash BIOS was not common, and the BIOS could be upgraded only by replacing the ROM BIOS chip. You might run into such a situation on an older machine, in which case you must contact the manufacturer of the BIOS to get a newer version, if one is available.

Step 1. Prepare for the task at hand. Be sure the computer is powered down and observe safe ESD procedures. Use the manufacturer's instructions to determine how to remove the hard drive in the portable. In some portables you do not have to use any tools–simply unlatch the hard drive compartment. In others you must open the computer case. Consult the user manual for your computer for the procedure, and remove the hard drive. Describe how you did it below:

_____

_____

Step 2. Consult the user manual for your computer and install the new hard drive into the drive bay. Once it is installed, take any necessary steps to have the hard drive recognized, then test it by booting up the computer. Finally, describe below how you installed the hard drive, and any changes you had to make to BIOS setup:

Step 3. Consult the user manual for your computer and determine what steps must be taken to upgrade the BIOS in the computer. Do not actually upgrade the BIOS, unless your instructor tells you to do so. Write down what steps must be taken to upgrade the BIOS on the portable computer.

***For information on upgrading system performance on portables by replacing batteries, adding memory, and installing PC cards, read the section titled "Portable Computer" in Chapter 2 of the* A+ Certification Study Guide.**

LAB ANALYSIS TEST

1. A customer, the Aerobatics Alliance, has asked you to install a second hard drive into a system that presently has a single hard drive and a CD-ROM drive. What information do you need before you do the actual install?

2. After one of your customers purchased a SCSI tape backup system for his departmental file server, he realized that the server does not have a SCSI controller on the motherboard. He is now convinced that the tape drive cannot be installed in that server. What can you do to help the customer?

3. Harry, in the shipping department of a mail order company, has complained to you that he connected his USB video camera to his Windows 2000 computer, but the Found New Hardware wizard did not know what type of device it was. When he attempted to install the driver that came with the camera, a message appeared stating that the program was incompatible with that version of Windows. Clicking the Details button on that message directed him to visit the Microsoft Web site. He connected to the site and clicked on the Compatibility link, which took him to the Hardware Compatibility page. A search on the brand and model of the camera failed to find the product. What advice do you have for Harry?

4. You have upgraded memory on several different models of Toshiba laptops. Now you are getting ready to upgrade the memory on laptops from Compaq and you have some extra memory modules from the Toshiba computers. Will you be able to use the same memory modules in the Compaq laptops?

5. Your computer suffered a crash this afternoon. After booting it up again, what procedure should you follow?

KEY TERM QUIZ

Use the following vocabulary terms to complete the sentences below. Not all of the terms will be used.

CHKDSK

hot swappable

BIOS

hard disk controller

master/slave configuration

IEEE

CMOS

primary/secondary configuration

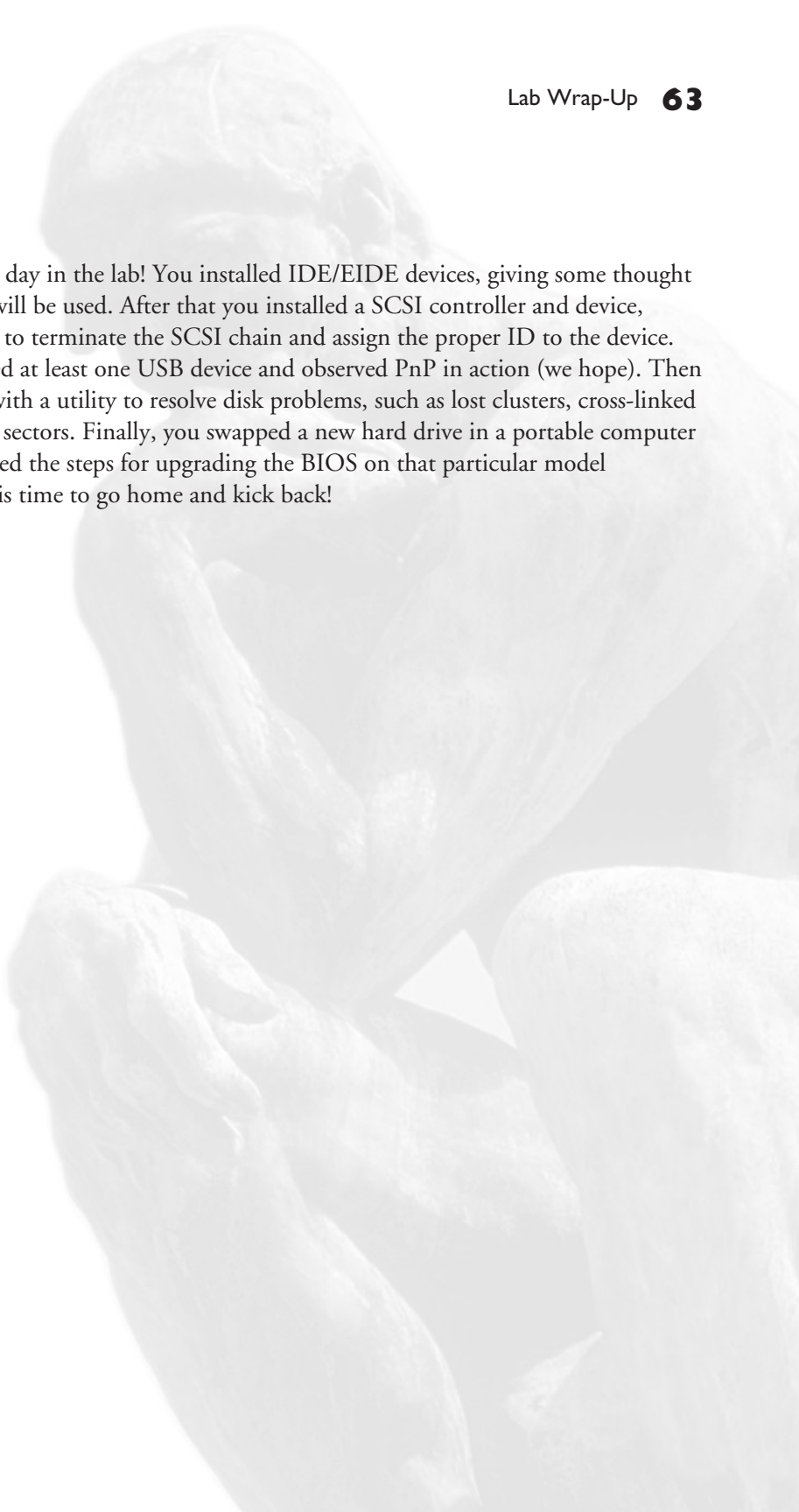
ScanDisk

terminate

1. When you have two IDE/EIDE drives installed on a single channel, they have a relationship that is described as a _____.
2. When connecting a new SCSI device to a chain, if you do not properly _____ it, you can make every device on the chain unusable.
3. USB devices are both PnP and _____.
4. The Windows 2000 and Windows NT program for resolving problems with disk allocation and bad sectors is _____.
5. If a computer is unable to work with a new device, you may need to upgrade the _____.

LAB WRAP-UP

Another hard day in the lab! You installed IDE/EIDE devices, giving some thought to how they will be used. After that you installed a SCSI controller and device, remembering to terminate the SCSI chain and assign the proper ID to the device. You connected at least one USB device and observed PnP in action (we hope). Then you worked with a utility to resolve disk problems, such as lost clusters, cross-linked files, and bad sectors. Finally, you swapped a new hard drive in a portable computer and determined the steps for upgrading the BIOS on that particular model computer. It is time to go home and kick back!



LAB SOLUTIONS FOR CHAPTER 2

In this section, you'll find solutions to the lab exercises, Lab Analysis Test, and Key Term Quiz.

Lab Solution 2.01

Step 1. The instructions on Step 1 are complete.

Step 2. It is always easier to configure the jumper settings for master/slave on drives before securing them in the computer. Once you have configured each hard drive to be a master (per instructions on the drive or in the installation manual for the drive), secure both drives in appropriate bays, using only the screws that properly fit the hard drives. Hard drives (unless they are removable) are not accessed from outside the computer, so they can be installed in bays without external access. Once the drives are secured inside, connect the hard drive from which you want to boot the operating system to the end of the cable you have connected to the primary IDE/EIDE channel. Connect the hard drive you intend to use for data to the end of the cable you have connected to the secondary IDE/EIDE channel on the motherboard. Connect the power connectors to each hard drive.

Step 3. There are several different methods of installing drives into computers. Some have a drive bay that directly fits the hard drive. You simply slide the drive in and insert four screws through appropriate slots in the computer frame and into appropriate threaded holes in the drive. Other computers use a drive bay that is wider than the drive and that has slots to hold rails that are attached to the drive. This system is designed for quick and easy installation and removal of drives, but it requires that rails be attached to the drive and then the drive slid into the computer. See Figure 2-1 for a close-up of a 4-inch wide SCSI drive with attached adapter plates and rails, and Figure 2-3 for a photo of that same SCSI drive resting on a 5.75-inch wide CD-ROM drive with screw holes in the sides. Also look at Figure 2-2 to see a photo of a computer with a rail-mounted hard drive and CD-ROM drive and an empty slot showing the rail guides.

FIGURE 2-1

SCSI Drive with Adapter Plates and Rails

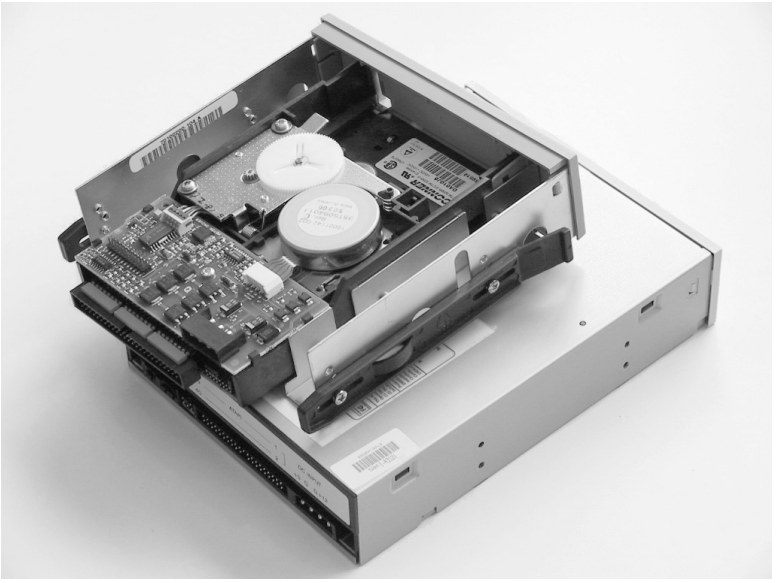
Remove the cover from an unused half-height drive bay. Slide the CD-ROM drive into the bay from the front. Be sure to line up the slots on the side of the bay with the holes in the drive, and ensure that the front of the drive is even with the other drives. Secure the drive with screws. Connect this drive to the remaining connector of the IDE/EIDE cable that is connected to the secondary channel on the motherboard. If the drive will be used for multimedia applications, connect the audio cable from the motherboard or sound card to the CD-ROM drive. Connect the power connector to the drive.

FIGURE 2-2

Computer with Rail Mounted Hard Drive, CD-ROM Drive, and an Open Rail-Mount Bay

FIGURE 2-3

SCSI Drive with Rail Mount and CD-ROM Drive



Step 4. The actual actions you take for this step will depend on the computer itself, and how it is configured. If you are unsure of how to close up the system unit, check the documentation for the computer and the devices that are installed. Be sure to reconnect the keyboard, mouse, and monitor if they were disconnected for the lab. Don't forget to also connect the power cords to the CPU and monitor!

Step 5. The instructions in the lab are complete, although the exact actions will depend on the BIOS setup program.

Step 6. You can confirm that the computer recognizes the drives by going into Windows Explorer. You may be surprised to see the CD-ROM drive recognized, but not the second hard drive. If the second hard drive is brand new and has never been partitioned or formatted, it will not appear in Explorer. You can still confirm its existence in NT with Disk Administrator, and in Windows 2000 (or greater) by using Disk Manager. In Windows 95/98 you run the FDISK program from a command prompt to view the drive and partition it. Working with these utilities is beyond the scope of this chapter, but will be explored further in Chapters 8 and 9.

Lab Solution 2.02

Step 1. The instructions for Step 1 are complete.

Step 2. When preparing a SCSI controller card for connection to an internal SCSI device, connect the internal interface cable to the card before installing it into the computer, because it can be difficult to this do once the card is installed. You will see in Figure 2-4 a picture of a SCSI card with an internal cable attached. Once the cable is connected, select an open expansion slot on the motherboard. Remove the slot cover for this connector from the back of the computer. You should not have to configure the controller for its SCSI ID because it should, by default, be configured to use SCSI ID 7, the highest priority ID. But check the documentation for the controller and verify that it is configured correctly.

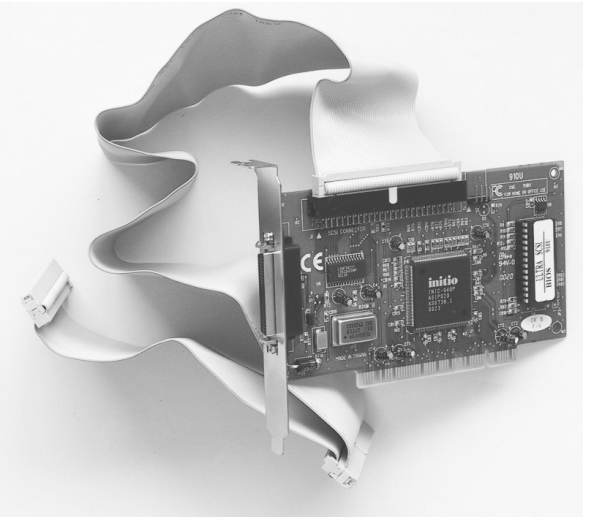
Answers to the question concerning the type of card will vary. The card used in our test lab, shown in Figure 2-4, is an Ultra SCSI-3 (Fast-20) with an 8-bit bus width and a maximum throughput of 20 MBps. It can be identified by the 50-pin high-density external connector that is only 1¼ inches wide. The internal cable resembles IDE hard drive ribbon cabling. Basically, if you have a 50-pin cable, the SCSI bus is 8-bit. The 16-bit SCSI bus uses 68-pin cables, and the 32-bit SCSI uses 110-bit cables. External connectors on older SCSI controllers look like Centronics parallel printer connectors, but are slightly wider, while the newer SCSI bus controllers use high-density connectors.

Step 3. Install the SCSI controller card by pushing it firmly into the selected expansion slot. Apply pressure as needed until the edge connector is completely and firmly seated. Remember to wiggle the card only back and forth lengthwise if you need to get it inserted, not at 90 degrees to the slot. Secure the SCSI card in place with a screw (the one you removed with the slot cover).

Step 4. If you do have a SCSI tape drive, this step will vary based on whether the drive is internal or external. An external drive connects by SCSI cable to the external connector on the controller card at the back of the computer. It also requires termination. If you install an internal drive, you first remove the front punch-out panel from an empty drive bay, slide the drive into the bay from the front, secure the drive in the bay, then connect the drive to the internal interface cable and connect the power cable.

FIGURE 2-4

SCSI Card with Cable Attached



Step 5. Close up the system unit, being careful not to dislodge cables.

Step 6. If the system fails to boot up after power is turned on, or if there are error messages associated with the SCSI controller (other than a missing driver), power down the computer and troubleshoot your configuration. SCSI problems center around improper termination of the SCSI bus and incorrect addressing of devices on the bus. If the system boots up and successfully loads the operating system, you should see a message that a new device is detected (except if you're using NT, which is not PnP). If the driver is already available on the computer, you may not have to do anything else. Otherwise you may have to provide device driver software when prompted. You may need to use Device Manager in Windows 95/98, Windows 2000, or Windows XP to troubleshoot problems with the controller. In Windows NT, you may have to run the SCSI Adapters program from Control Panel to add the driver.

Step 7. A device driver for the tape drive must be installed. This is done through a Control Panel program—Add/Remove Hardware in Windows 2000 and Windows XP, Add New Hardware in Windows 95/98, and Tape Devices in NT. Once the driver is installed, if you have a tape for the drive, test the installation by using your backup program. If you plan to use the backup program that comes

with Windows, run the backup program (NTBACKUP for NT and Windows 2000, MSBACKUP for Windows 95) to see if it recognizes the drive. If it does not recognize the drive, it may only work with a third-party backup program.

Lab Solution 2.03

Step 1. Reading the documentation is an important step because, with some devices, you may actually be required to install software before connecting the device. This is true of some of the cameras we have tested.

Step 2. Answers will vary. When we installed a Microsoft Optical Wheel Mouse on a computer running Windows 2000, the Found New Hardware message box was displayed with the following message: USB Human Interface Device. No additional steps were required.

Step 3. Answers will vary, but in general, this is a non-event, with no message displaying. If there is no other mouse on the computer, you will lose the mouse cursor.

Step 4. Observations will vary, but this is, once again, a non-event. In Windows 2000, the message described in Step 2 occurs only the first time the mouse is installed. If this is your only mouse, you will regain the mouse cursor.

Step 5. Observations will vary. If the device is detected, but there is no driver, the Found New Hardware wizard appears, and you may go through several screens to install the driver. If there is no driver available for the device, go to www.microsoft.com/windows, click on the link for your version of Windows and search for a driver for your device. In some versions this will be found under a link titled "Compatibility." If you fail to find the driver or information about the device at this site, look on the manufacturer's web site. When you locate the driver, download it and follow the instructions to install it.

Lab Solution 2.04

Step 1. Open a command prompt and enter the command CHKDSK. The results you receive will vary depending on the operating system you are running:

- Windows 95/98 will behave as described in the lab.
- Windows 2000 will behave as described in the lab.
- Windows NT will behave as described in the lab.

Step 2 The observations will vary, but here are some possible observations: Windows 95/98 ScanDisk is a GUI program. In ScanDisk you have a choice of tests to run. A Standard check will check only for logical problems, such as lost clusters and cross-linked files, and runs fairly quickly. A Thorough test will perform a Standard test, and also scan the disk surface for errors. It will fix the errors as described in the beginning of the lab. It takes much longer to run, but should be run on a regular basis as a means of preventive maintenance to prevent data from inadvertently being placed in areas of the disk that may have become damaged.

On a test computer (400 MHz Pentium III with 256MB RAM) the Standard test took 15 seconds on a 2.1GB drive, while the Thorough test took 5 minutes 10 seconds. That is nearly 21 times longer—and we did not select write check or error correction!

Windows NT and Windows 2000 CHKDSK perform as described in the lab.

Step 3. Step 3 is complete and no answer is required.

Step 4.

a) Two utility DLLs used by CHKDSK are UNTFS.DLL and UFAT.DLL.

b) The optional fourth pass of CHKDSK performed when the /R switch is used.

c) A good reason for running CHKDSK in read-only mode is to run it during a period of low system usage just to predict how long it will take to run it on that volume. A reason not to run CHKDSK in read-only mode is that if read-only mode encounters errors in the earlier phases, it may falsely report errors—reporting that a disk is corrupted when that is not the actual error detected. This occurs because read-only mode does not lock the volume,

and therefore may become confused by alterations made to NTFS on behalf of other processes while it is running. Running CHKDSK with /F or /R (write mode) will lock the volume and avoid these invalid errors.

Lab Solution 2.05

Step 1. Answers will vary from model to model. On one portable, turning the computer over, locating the hard disk drive latch, unlatching it, and sliding the case containing the hard disk out of the bay accessed the hard drive. See Figure 2-5 for a photo of the hard drive in its case and the empty bay.

Step 2. Answers will vary from model to model. To install a new hard drive in the same computer, you may need to remove the old hard drive from the case. This requires removing two screws—one on each side of the case—and carefully disconnecting the cable within the case. Once the old drive is removed, the new drive can be inserted into the case and the screws refastened. Then, the case is reinserted into the bay until the latch clicks shut.

Step 3. Answers will vary from model to model. In our test computer, the instructions for upgrading the BIOS were in the manual under the heading, "Updating the Flash ROM BIOS." This type of BIOS can be updated with

FIGURE 2-5

Portable with Hard Drive Removed

software, rather than physically replacing the BIOS chip. The action of updating this type of BIOS is often called "flashing" the BIOS. In order to do this, you must first obtain the flash program with the updates to the BIOS from the manufacturer, then follow the instructions to flash the BIOS. On some systems you may have to set a special set of dip switches inside the computer and reboot before running the flash program. Many do not require a hardware change like that.

ANSWERS TO LAB ANALYSIS TEST

1. Answers will vary. First, you need to know what type of hard drive and CD-ROM they presently have. A desktop PC is most likely to use IDE/EIDE, but it doesn't hurt to ask. If you determine that the drives are IDE/EIDE, then knowing the make and model of the PC will help you to determine whether you will have any problems with BIOS compatibility for a new, many-gigabyte hard drive. Once you know the make and model, you can often find the information you need at the manufacturer's web site. You may actually need to update the BIOS. Directions for doing this should be at the site.

   Then, because each IDE/EIDE channel can have a maximum of two devices, you will have to confirm that there are two IDE channels available—this information too should be on the web site or in the owner's manual for the computer.

   Finally, ask the customer how he plans to use the second hard drive and the CD-ROM drive. See the information in Lab 1.01. Basically, you want to give the drive with the most traffic its own channel. Some CD-ROM drives cannot be alone on a channel, but others can. So if you decide that the CD-ROM drive should be alone on its own channel, you may also have to check this out. The most likely configuration will be to have the present hard drive (containing the operating system) remain as master on the primary channel, install the new hard drive as master on the secondary channel, and install the CD-ROM drive as slave on the secondary channel.

2. You can tell the customer that he can still use his tape drive if they have an available expansion slot, and if he purchases a SCSI card and connector cable that is compatible with the tape drive.

3. I would recommend that Harry contact the manufacturer to see if they have released a new driver for the device. If the device is more than two years old, it is possible that the manufacturer has no plans to create a driver for Windows 2000.

4. Not likely! Most laptop manufacturers use proprietary memory modules.

5. After a system crash, you probably have lost clusters and even cross-linked files on your disk. Therefore, run the CHKDSK or ScanDisk program. After the program runs, check to see if it produced *.CHK files. If it did, attempt to verify that you are not missing any important files on that drive. If data is missing you may want to try to retrieve it from these files or restore the files from a backup. When done with the files, delete all the unneeded files.

ANSWERS TO KEY TERM QUIZ

1. master/slave configuration
2. terminate
3. hot swappable
4. CHKDSK
5. BIOS